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CUCUMBERS

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CUCUMBERS.

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INTRODUCTION.

Few garden plants have been known to and cultivated by man longer than the cucumber. De Candolle has proved that this plant has been in cultivation between three and four thousand years. It is not strange in view of this fact that it has become a standard garden vegetable, and that numerous devices have been resorted to to bring it into cultivation under climatic conditions where it would not nor-

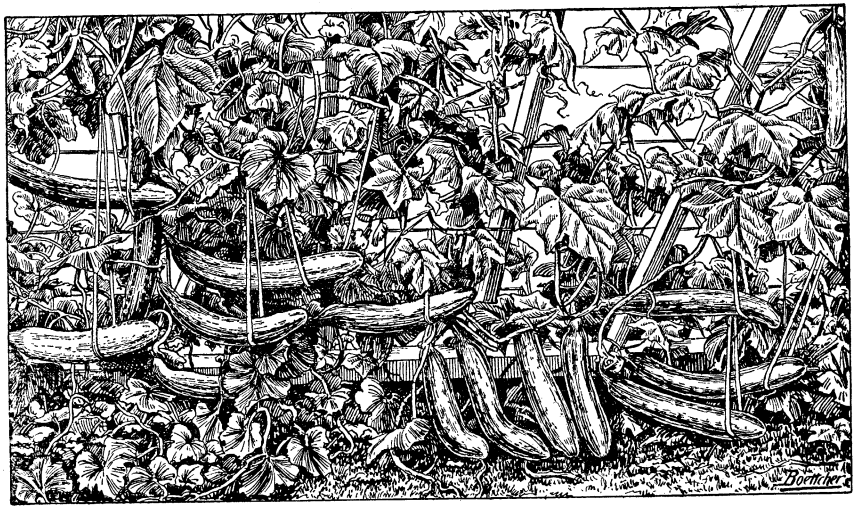

FIG. 1.—The English or forcing type of cucumber

mally thrive and at a time of year when it could not be grown in the open. As a result of these attempts to supply the table of man with this delicacy at all seasons and in varying climates, two types of cucumbers which are very distinct have been produced. One—the English or forcing type of cucumber, shown in figure 1—has been developed and is grown almost exclusively under glass. The short type of fruit,

somewhat triangular in cross-section, which we are pleased to call the American type, illustrated in figure 2, is extensively grown in the field for pickling purposes and for early slicing fruits. This type is also grown in cold frames and forcing houses more extensively in the United States than is the English forcing type.

Normally the cucumber is a lover of subtropical conditions, but it will not thrive under extreme heat and it will not endure frost. Before the danger of frost has disappeared in the spring it is necessary to give the plants protection unless planting is delayed until this danger point has passed. In order to grow the plants under glass, a summer temperature ranging from 60° at night to 70° or 75° F. during the day must be maintained.

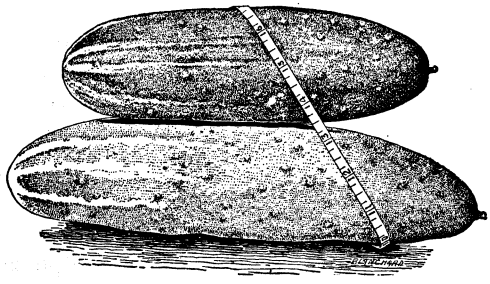

FIG. 2.—The American type of cucumber.

Because the plant requires only a short period for its development there are comparatively few localities within the confines of the United States where its fruit can not be successfully brought to edible condition during the normal growing season. The character of the fruit and the condition in which it is demanded in the market enable it to be grown at a distance and shipped by rapid transportation to the point of consumption during those seasons of the year when it can not be successfully grown in the open to supply the local demand. As a result of this, an important industry with the cucumber as its foundation has been built up in each of the crop zones along the Atlantic coast from Florida to Maine, the harvest period for each of these localities being determined by market demands and the progress of the season.

To discuss the subject of cucumber culture intelligently, therefore, it has seemed wise to divide it into the following heads:

(1) Growing cucumbers for early market in the open.
(2) Growing cucumbers for early market in cold frames.
(3) Growing cucumbers for pickling purposes.
(4) Forcing cucumbers under glass.

GROWING CUCUMBERS FOR EARLY MARKET IN THE OPEN.

From Florida northward throughout the whole trucking area along the Atlantic coast the cucumber is a staple trucking crop. In recent years it has also found a satisfactory place in the truck crop practices of Texas, Louisiana, and other Gulf States.

SOIL.

The soil best adapted to the cultivation of cucumbers in the open is a light sandy loam, one which responds quickly to temperature and fertilizer. Such soils are prepared early in the season and thrown into gentle undulations, so as to produce slight ridges upon which to plant the seed to insure good surface drainage. It is customary upon soils of this character to practice the plowing under of cowpeas or soy beans when the area is not in use for trucking purposes and to supplement this use of green manure by heavy applications of high-grade truckers' fertilizer. It is not unusual to apply from 1,000 to 2,000 pounds of high-grade fertilizer to the acre on this crop.

The turning under of heavy crops of green plants, such as cowpeas or soy beans, and the use of commercial fertilizers tend to render the soil acid. To correct this evil, the soil should be given an application of lime once in three or four years at the rate of 1,000 to 1,500 pounds per acre. This will sweeten the land and assist to liberate the plant food locked up in the soil. Lime also has a valuable mechanical action on the soil, rendering it more easily tilled.

If stable manure is available, the use of green-manuring crops can in great measure be dispensed with, but in most localities where cucumbers are extensively grown for early slicing purposes the available supply of stable manure is inadequate and the use of green crops, lime, and commercial fertilizers must be the chief dependence. On light sandy and gravelly soils the use of green-manuring crops is of more importance than in those regions where the soil is of the prairie type and heavily charged with organic matter.

In instances where it is desirable to use stable manure and the supply is inadequate for a general application, the manure can be made to go much farther and do good duty by using it under the hills. When so used, a common practice is to throw out a furrow along the line of the row and to place a shovelful of well-rotted manure in the bottom of the furrow at the cross marks, 3, 4, or 6 feet apart. After the manure has thus been distributed the furrow is then turned back, which covers the manure and at the same time fills the trench.

PLANTING.

There are almost as many methods of planting cucumbers as there are growers. Some plant in hills the standard distance of 6 feet apart each way; others plant in hills 6 feet apart in one direction and 2 or 3 feet apart in the row, while others plant in drills or broad belts 6 feet apart and chop out the plants to stand about a foot apart in the row after all danger from insect depredation has ceased. The methods which seem most economical under the conditions at hand will of course be adopted by the grower.

If the plantation has been prepared by the use of well-rotted stable manure under the hills, the surface should be kept on a level with the general surface of the area and the seeds scattered so the plants will receive the advantage of the fertilized area. In any case a liberal quantity of seed should be employed. A good stand of plants is the first step in growing a profitable crop.

A successful plantation on either of the above plans should give a field of the appearance of that shown in figure 3.

After the plants have appeared above ground, cultivation is carried on until the vines interfere to the extent of danger of injury to them, after which horse cultivation is abandoned and any weeds which appear are removed by hand.

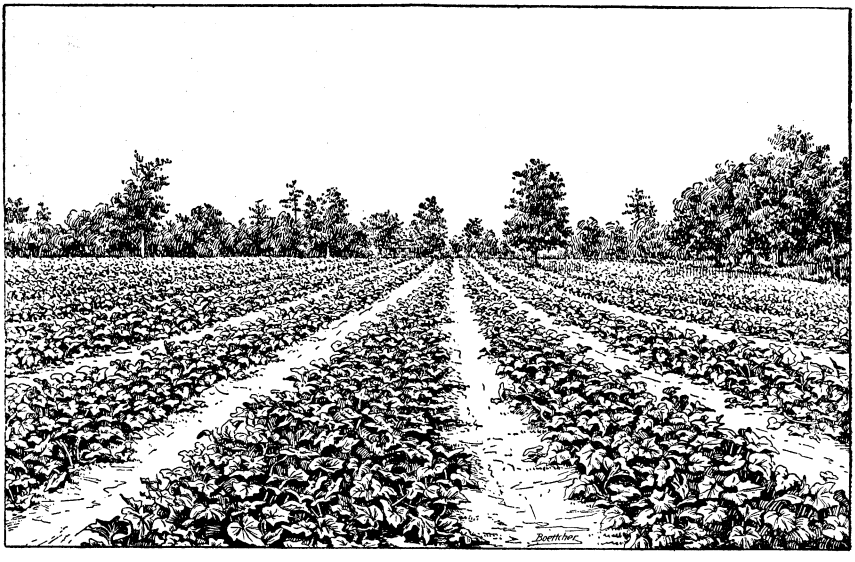

FIG. 3.—General view of a cucumber patch.

In outdoor culture the cucumber is frequently used as a companion crop to other crops, like beans, as illustrated in figure 4. Beans being of rapid growth "come on" quickly and form a partial protection or wind-break for the young cucumber plants. When arranged in this way, cucumbers are planted in drills or in hills 6 feet apart and a row of beans is placed between two rows of cucumbers, a method which insures a very complete and satisfactory use of the ground. The quick maturity of the beans allows them to be harvested and entirely removed from the area before it is required for the cucumbers.

An expedient which is sometimes practiced by cucumber growers in order to protect the early crop is to plant rye upon the area during the fall. Rye grows rapidly early in the season and reaches some height

before it is safe to plant cucumbers in the open. As the time approaches for placing the cucumbers in the field narrow swaths are cut through the rye field corresponding with the rows of cucumbers, leaving belts of rye standing between the rows of cucumbers and at right angles to the prevailing winds. The plants for this purpose are started in strawberry boxes either in a hotbed or greenhouse, and when they have attained 8 or 10 inches in height or are about ready to vine they are removed to the open and placed in the area from which the rye has been removed. The standing rye serves as a windbreak and a protection to the young plants. As the plants grow and

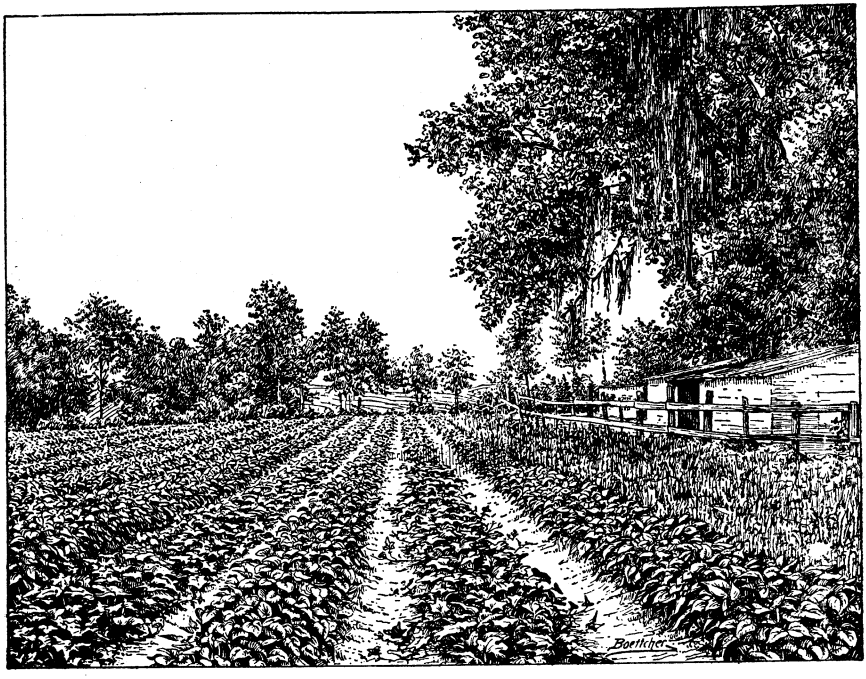

FIG. 4.—Beans and cucumbers planted side by side.

require the whole area the remaining portion of the rye is cut and cultivation follows to break up the stubble and to give the plants needed attention.

DISEASES.

The next important step in the production of cucumbers is constant watchfulness for the appearance of blight or mildew, and immediate, thorough treatment when discovered. These diseases are of almost annual occurrence throughout the southern trucking region, and growers of cucumbers should plan to make the spraying of the plants a regular feature of their cultural work.

For details and directions in regard to cucumber diseases and their treatment, consult Farmers' Bulletin No. 1371, Diseases and Insects of Garden Vegetables.

The subject of disease is, however, of such great moment to the truck grower that the general preventive treatment for blight and mildew should be mentioned at this point. This consists of thoroughly spraying the plants with Bordeaux mixture once in ten days or two weeks after they have begun to run. Bordeaux mixture is made by bringing together the milk of lime and a solution of copper sulphate (bluestone). For cucumbers it has been found that a mixture made from 4 pounds of copper sulphate and 4 pounds of freshly burned stone lime to 50 gallons of water makes the safest and best solution for this work.

If the patch to be sprayed is a large one and the solution is required in large quantities, the directions for preparing Bordeaux mixture given in Farmers' Bulletin No. 243, Fungicides, should be consulted.

FIG. 5.—Men pouring together milk of lime and bluestone to make Bordeaux mixture.

The 4-4-50 formula mentioned above, however, should always be followed in preparing the mixture for cucumbers.

To make the Bordeaux mixture on a small scale, take two half-barrel tubs, one for the copper sulphate solution and the other for the milk of lime solution. Place 4 pounds of lime in one tub and slake this with sufficient water to thoroughly break up the lime without allowing it to burn. After the lime is thoroughly slaked, dilute it to 25 gallons. Into the other tub pour 25 gallons of water and suspend in it 4 pounds of copper sulphate in a gunny sack or other porous sack for 24 to 48 hours before the solution is required. Bordeaux mixture is then made by pouring these two solutions through a wire-cloth sieve which has about 18 to 20 meshes to the inch, equal quantities of the two solutions being poured at the same time through the strainer, which should be suspended over a barrel or other receptacle sufficiently large to hold 50 gallons of the mixture. In making this combination it is best to have two men dipping simultaneously from each receptacle and pouring the two solutions together into the strainer, as shown in figure 5. The milk of lime solution should at all times be kept thoroughly stirred, as should also the copper sulphate solution.

When large quantities of Bordeaux mixture are required, stock solutions are made in 50-gallon casks, the concentration of the copper sulphate solution being ½ pound of copper sulphate for each gallon of water—that is, 25 pounds of copper sulphate to 50 gallons of water—and of the lime solution ½ pound for each gallon of water—that is, 25 pounds of lime to 50 gallons of water. In making Bordeaux mixture 8 gallons of the copper sulphate stock solution are placed in one dilution barrel and 8 gallons of the stock solution of lime in a second dilution barrel, each dilution barrel then being filled with sufficient water to make 25 gallons in each receptacle. These diluted solutions are then drawn or poured together, as above described, to make Bordeaux mixture. In applying the mixture to the vines the directions given in Farmers' Bulletin No. 1371 should be carefully followed.

ENEMIES.

While there are many drawbacks to the culture of cucumbers, the striped cucumber beetle is by far the most abundant and most troublesome pest with which the grower has to deal. A description of the habits and life history of this insect is given in Circular No. 31, Bureau of Entomology. The following is a digest of that publication prepared by its author, Dr. F. H. Chittenden:

There is no specific remedy for the striped cucumber beetle. Direct applications of poisons, such as Paris green or other arsenical, will destroy the beetles when they occur in moderate numbers. Arsenicals are used alone or mixed with finely sifted plaster or similar diluent in the proportion of 1 to 75 by weight, dusted over the young plants. Pyrethrum applied with a powder bellows is too expensive for general use, but is valuable in small gardens. It is applied early in the morning when the dew is on. Owing to the inefficiency of topical applications when the insects are most abundant, recourse must be had to preventives and repellents and cultural methods.

Covering young plants.—To prevent injury to young plants various coverings are used. A cheap frame may be made by cutting a barrel hoop in two, so as to form two semicircles, which are then placed at right angles to each other, and the ends inserted in the ground with the curve uppermost. Two strong wires bent in the form of croquet arches can also be used. The frame is covered with gauze or similar material, held in place with earth packed about the edges, to prevent the beetles working under it.[a] It is necessary to keep the plants covered only while they are young, and the same covering may be used year after year.

Early planting, etc.—Where no covering is used it is advisable to start the plants in frames or in hothouses, or to plant the earliest varieties and set them out as soon as possible, so as to get them well established before the beetles appear. In combination with this, the setting out of late varieties should be postponed until after the first appearing beetles have laid their eggs and dispersed.

Planting an excess of seed.—A certain degree of relief can be secured by planting an excess of seed. After the first danger is passed the hills can be thinned out to the desired

[a] A simple substitute for the above plan is provided by inserting a small stake in the center of each hill, leaving 6 to 8 inches above the surface. Over this drop a piece of mosquito bar 18 to 24 inches square and hold in place as above directed.—L. C. C.

number. A good method consists in planting in squares, one each week, as shown in the accompanying diagram. The first planting "1" is frequently killed, and may be followed by 2 and sometimes 3. As long as the insects are seen they are poisoned with an arsenical, and this is continued until a stand of plants is obtained, as it is seldom that all four plantings are destroyed.

1	2
3	4

Clean culture and trap plants.—Much injury may be prevented by attention to clean methods of cultivation. As soon as the crop is harvested the vines should be covered with straw or other inflammable material and burned. A few plants left standing throughout the fields will attract such insects as may not have been reached by the fire, where they can be easily destroyed with a spray of strong kerosene emulsion or by Paris green. As traps for the last generation, plant later or use later varieties. By destroying the beetles at this time the numbers for the ensuing year will be greatly diminished.

Some exemption from injury may be attained by planting beans in alternate rows before the cucumbers. The beetles congregate on the beans, and, having an abundance of food, are not forced by hunger to attack the young cucumbers. Gourds planted in the vicinity of other cucurbits are claimed to act successfully as a trap.

Driving with air-slaked lime.—In some melon and squash growing sections "driving" is resorted to as a means of controlling this insect. In the morning when the beetles are active air-slaked lime is dusted over the plants with the wind, and the beetles fly before it to the next patch, where similar methods are employed.

Arsenicals, with ashes, dust, or plaster.—A remedy frequently advised is to dust the majority of the plants with sifted wood ashes, road dust, or land plaster, and cover the remainder with an arsenical. The beetles congregate on the clean plants, where they are killed by the poison, not always, however, before they have fed to such an extent that the plants will be more or less damaged.

Repellents.—Land plaster or gypsum thoroughly saturated with kerosene or turpentine acts as a repellent. The vapor of turpentine is reported to be particularly distasteful to this insect. Tobacco dust sprinkled on the hills, particularly when the soil is moist, has the advantage of being, like turpentine and plaster, a good repellent, and acts also as a fertilizer and mulch for the plant.

Direct remedies must be repeatedly applied, particularly when rainfall necessitates their renewal, until the plants have obtained a good start or the insects have dispersed.

A considerable degree of exemption from injury accrues from the stimulation of a crop by heavy manuring and frequent cultivation. Fertilizers should be productive of the same results.

With the exercise of good judgment in planting and combined effort among growers of cucurbits over a considerable tract of country in the use of such of the above-mentioned remedies as may be preferred the total damage from the striped cucumber beetle should be greatly lessened.

MARKETING.

As soon as the cucumbers reach marketable size—i. e., from 6 to 10 inches in length—they are picked from two to three times a week and sorted and graded so as to place all those which are perfect in shape and uniform in size in one grade, which are usually packed in baskets of the Delaware type[a] holding a bushel or a half-barrel. Those fruits which are of inferior size and slightly defective in shape are packed in ventilated barrels and shipped in ventilated or refrigerator cars.

In Texas, where cucumbers are extensively grown and shipped to distant markets, they are purchased from the farmers by the bushel

[a] Baskets of this type are made of staves fastened to a circular board bottom and held in the middle and at the top, which is much larger than the base, by wood or wire hoops.

by jobbers or dealers, the cars in which they are shipped being standard refrigerator cars in which a false floor is laid over the floor of the car by placing 2 by 4 inch scantling on edge and laying a floor of 1 by 3 inch slats, with intervals of three-quarters of an inch between the slats. Another floor of similar construction is placed about halfway between the bottom of the car and the roof, uprights being set upon the first laid floor to support the second. The cucumbers are then loaded into the car in bulk, as are potatoes. About 600 bushels can be handled in this way in a single car. Refrigeration can be as perfectly accomplished in a car loaded in this manner as in a car packed with cucumbers in packages. The advantage to the shipper and grower is that there is no expense except that for flooring and decking the car, as above noted, which amounts to from $12 to $20, depending upon the cost of material. Very satisfactory results are reported by dealers handling cucumbers in this manner. Successful shipments have been made from Corpus Christi, Tex., to New York, Chicago, San Francisco, Boston, and Seattle, thus demonstrating the feasibility of the plan.

YIELD.

The yield of cucumbers to the acre depends on the season, the variety grown, and the skill of the planter. A normal crop, however, may be placed at about 200 half-barrel baskets per acre, the price varying from 50 cents to as much as $2 per basket.

After the fruits have been harvested and the marketing season has closed, the vines should be destroyed by gathering and burning or plowing them under, so as not to harbor or breed diseases.

GROWING CUCUMBERS FOR EARLY MARKET IN COLD FRAMES.

In certain localities along the Atlantic coast from Washington southward special types of the trucking industry have been developed. One of the most interesting phases of this development is found in the methods employed in bringing the cucumber to marketable maturity. While in most localities cucumbers can be successfully grown in the open ground, in some situations it has been found advantageous and very profitable to go to the expense of starting cucumbers under glass in cold frames, like those shown in figure 6, and developing them in this situation until they fill the space covered by the frames, after which time, if weather conditions are favorable, the sash and frames are removed and the plants are allowed to occupy the entire area.

This branch of the cucumber industry is frequently combined with the cultivation of lettuce and is carried on in much the same way that the lettuce and cucumber industry is conducted in the great forcing establishments in the neighborhood of Boston and other northern cities.

Lettuce being a hardy crop can be sown in the autumn and the plants carried through the most severe portion of the winter in sash-protected frames, or the seed can be sown early in January in frames and the plants brought to marketable maturity in that situation. In most localities as far south as Norfolk, however, it is the practice to produce a fall crop of lettuce under frames which shall go to market about the Christmas holidays, this to be followed by a second crop of lettuce on the same area, to be marketed in March or April. Before the lettuce is harvested a sufficient number of plants are removed to allow cucumber seeds to be planted in the frames at proper intervals, so as to insure a stand of cucumbers under the protection of the

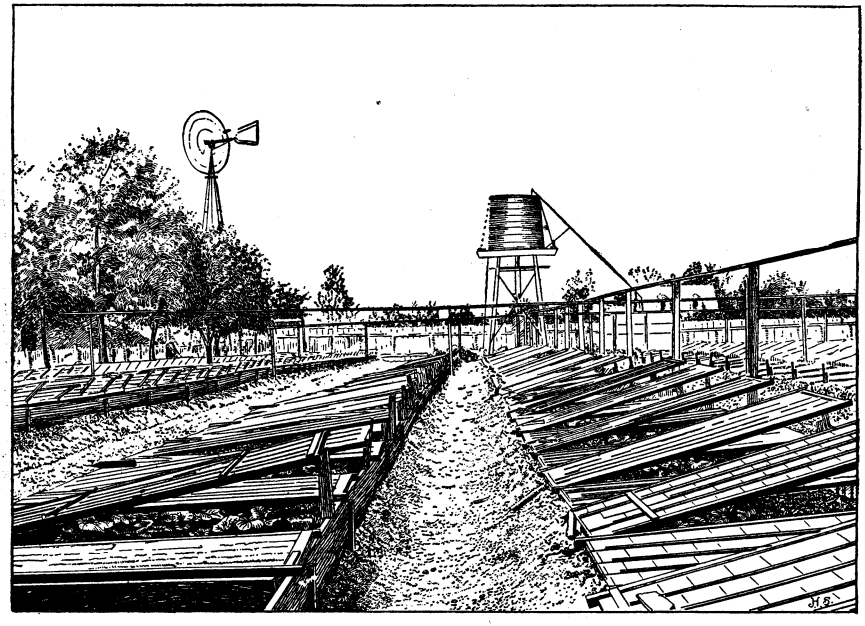

FIG. 6.—Cold frames for growing cucumbers.

frames. After this second crop of lettuce goes to market the ground is given up entirely to cucumbers. In some instances the cucumber industry is the only one carried on under the frames. The planting of seeds in the latitude of Norfolk can begin about February 20 to March 1.

SOIL.

Soil for use in cold frames should be a well-enriched sandy loam of the type of the Norfolk sandy loam. If it can be dark in color, this is an advantage. If normally light, the color can be changed by the addition of muck or by incorporating well-decomposed stable manure with the surface soil. A dark color is of some advantage in helping to raise the temperature in the frames under the glass.

WATERING.

Since the glazed sash prevent the soil beneath them being moistened by natural means—that is, by rain or dew—it is necessary that means be provided for watering or irrigating the plants. This can be done by arranging pipes upon the surface of the ground or at a convenient height overhead, so as not to interfere with cultivation, from which water can be drawn to sprinkle the surface of the beds at desired intervals and as the plants may require. The work of watering should, however, be very carefully done. The same general precautions necessary for the care of plants in cold frames should be observed—that is, to do the watering in the morning on bright days only, when air can be admitted and when the sun will soon dry the moisture from the leaves of the plants. In this way much can be done to protect the plants from injury from such diseases as the damping-off fungus and mildew.

It is the common practice to plant only a single row of cucumbers through the cold frame, placing the hills at intervals of 2 feet through the center of the continuous frame. Such frames are made of boards about 12 inches high at the back and about 8 inches high at the front side, which are held in place by stakes driven in the ground or by cleats used as guides for the sash. In length these frames are multiples of 3 feet, depending upon the area to be occupied by the cold frame.

VENTILATION.

Besides the precautions to be observed in watering plants in cold frames, extreme care is necessary to give the plants sufficient air to keep them in a healthy condition. If the atmosphere is allowed to become close and very hot, the plants will be weakened and thus rendered more susceptible to the attacks of plant diseases. The various ways in which the sash may be arranged to give air, shade, or protection from drafts are suggested in figure 7. Strong, vigorous, rapidly growing plants, however, can be produced under these conditions by skillful management. The advantage of the frame is that the grower has under his control to a large extent the amount of water which the plants

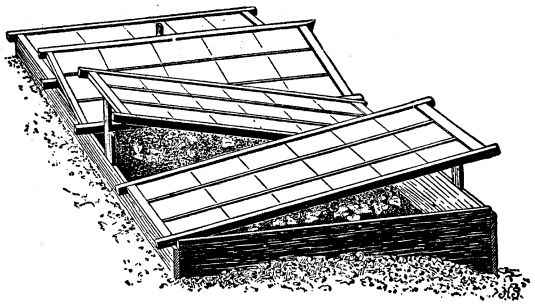

FIG. 7.—Various methods of arranging cold-frame sash to secure ventilation, shade, or protection.

receive, the time at which it is applied, and the temperature of the surrounding air. These, as will be observed, are very important factors at a time of year when the plants can not be safely placed in the open.

In some instances where lettuce is used as a companion crop to cucumbers the cucumbers are started in a separate cold frame, hotbed, or greenhouse in quart berry boxes, and when the plants have attained a height of 8 to 12 inches and the cold frames are cleared ready for their reception the berry boxes are buried at intervals of 2 to 3 feet from one another through the center of the cold frame, the same as are the seeds when they are planted directly in the soil. This plan is economical of space in the cold frame during the early life of the cucumber plants, and if they are started in a greenhouse or hotbed it enables the grower to bring them on earlier than he normally could in the cold frame. It also allows the cold frame to be used a longer time during the season for the production of lettuce.

FERTILIZERS.

The soil for cucumbers should be made very rich by the annual application of heavy dressings of stable manure to be incorporated with the soil. During the time it is not occupied by cucumbers or lettuce, cowpeas are frequently grown upon the area and turned under prior to planting a fall crop of lettuce. In addition to this, liberal applications of a fertilizer carrying a considerable percentage of nitrogen are employed.

REQUIREMENTS FOR SUCCESS.

The keynote to success in this work is a thorough understanding of the needs of the cucumber, good equipment as regards sash, a sufficient water supply always at one's command, and great diligence in regard to the manipulation of the sash covering the cucumbers, so as to prevent direct drafts of air upon them and to provide at all times sufficient fresh air to keep the plants in a congenial temperature, so as to induce a sturdy, rapid growth. With this treatment it is possible to bring cucumbers into fruit in the latitude of Norfolk by the middle of May.

As soon as the weather is sufficiently settled and the danger of cold waves or chilly nights is past the sash are removed and stored until needed in the autumn. The boards of the frame are stacked until required for other purposes and the cucumbers are given the entire area.

Cucumbers produced under these conditions are of necessity more expensive than those grown in the open, but since they mature several weeks in advance of the field crop they find a market in which there is little competition except from cucumbers grown in forcing

houses. The result is that, as a rule, very satisfactory prices are obtained for this product.

Cucumbers grown in this way are usually marketed in boxes or half-bushel peach baskets of the Delaware type.

GROWING CUCUMBERS FOR PICKLING PURPOSES.

The cultivation of cucumbers to supply the demands of the pickle trade has assumed important commercial proportions in certain sections of the United States. As a rule this industry is not of long duration in any locality. The salting stations, as they are called, which are the gathering points used by the pickle factories, are in the main of inexpensive construction, and those parts which are most durable can be moved as necessity requires. The history of the pickle industry in any particular locality does not cover a period of more than six to ten years.

In general the price paid for cucumbers is remunerative, and the industry if it could be carried on on an extensive scale would be a very profitable one. The fact that only a small acreage of cucumbers can be handled by any single grower renders it a less attractive and less profitable crop in the aggregate than it would be if large acreages could be handled. The reason that only a small area can be grown by individual farmers is the great amount of hand labor required to gather the fruits. During the bearing season it is necessary to go over the patch at least three times each week in order to secure the fruits within the range of the sizes which will be accepted by the pickle factories—that is, from 2½ to 4 or 5 inches in length. Few farmers have sufficient assistance to allow them to grow more than one or two acres. If the picking of cucumbers were work which could be carried on by children it would not present so many difficulties. The fruits are heavy, and the fact that it requires experience to find them under the leaves makes it men's labor rather than that of children.

SOIL.

The soil which is best adapted to the growing of cucumbers in the open ground is a sandy, gravelly, or clay loam. The sandy loams are best suited to the cultivation of cucumbers for early markets, and gravelly and clay loams are best for those intended for later harvesting, such as are demanded by the pickle factories.

The commercial cultivation of cucumbers intended for use by the pickle factories is largely confined to the higher altitudes and latitudes, the warm long season of the South not being as congenial to the growth and development of this plant as are the cooler and more retentive soils of the North. The pickle industry is, therefore, chiefly confined to latitudes north of the city of Washington.

PLANTING.

After the soil has been thoroughly prepared as for the reception of any hoe crop it is usually laid off in checks 6 by 6 feet or 3 by 6 feet, or the seeds may be planted in drills 6 feet apart. The particular system employed is a matter of choice by the grower, some claiming that one system is more economical than another. In the long run, however, it is usually best to employ the check-row system, as the cost of cultivation is thereby reduced. The operation of keeping the land free from weeds when the plants are planted in check rows can be almost entirely accomplished by the use of horsepower implements, while in the case of seeds sown in drills it is almost impossible to keep the plants free from weeds without resorting to hand weeding. When the seeds are planted in check rows a sufficient number are scattered promiscuously about over an area about a foot in circumference to secure a stand of from 4 to 6 plants to each hill, 10 or 12 seeds being planted. After all danger from injury by insects is past the plants are thinned to 5 or 6 to the hill, some growers reducing them to 3 or 4 to the hill. Clean cultivation then follows until the vines are sufficiently large to occupy the entire area.

The time for planting varies somewhat, according to the locality, but for central western New York the planting season begins about the first of June and ends about the first of July. The harvest from the early planted seeds begins in the last part of July and continues without interruption until the vines are destroyed by frosts, unless they are seriously affected by some fungous disease, which of course is not unusual in areas where cucumbers have been grown for a number of years.

HARVESTING.

Cucumbers intended for pickling purposes are harvested when they have attained a length of from 2½ to 5 inches. Because such cucumbers are bought by weight it will readily be seen that the small-sized pickles are less profitable to the grower than are the larger ones, and in order to secure them before they have attained an unsalable size it is necessary that the picking be repeated at frequent intervals, as cucumbers grow rapidly and a delay of twenty-four to forty-eight hours in harvesting would render many of them unsalable. It is therefore necessary to have regular intervals to harvest certain areas of the patch and to continue this routine throughout the bearing season.

Another point which is of prime importance in the management of the cucumber patch is that none of the fruits be allowed to come to maturity. The ripening process, which means the development and maturing of the seeds, produces a heavy strain upon the growing plant, the life and yield of the plant being in proportion to the number of

fruits which are allowed to ripen. If no fruits are allowed to come to maturity the plants will remain green and in an active vegetative condition longer and will produce a much larger aggregate number of fruits.

Cucumbers are usually pulled from the vines and placed in suitable receptacles, either baskets with handles or crates. The slat bushel crate so extensively used in harvesting potatoes and apples is employed in many localities for harvesting cucumbers. After picking, the cucumbers are hauled direct to the salting stations, where they are weighed and credited to the account of the man delivering them. The usual price paid per ton for cucumbers suitable for pickling purposes is $15, and the crops range from 3 to 8 or 9 tons to the acre. It is not at all unusual for farmers to secure a gross return of $100 to $120 per acre from this crop.

The chief expense in connection with the production of this crop, as has already been mentioned, is harvesting. Several instances have come to the notice of the writer in which one-half the crop, after it has been grown, was offered by farmers in order to get it harvested, and even on these terms the offer was not quickly taken.

THE SALTING STATION.

The gathering points or receiving depots maintained by pickle factories in communities where cucumbers are commercially grown are called salting stations. The equipment of the salting station consists of a long, low building provided with a large number of wooden tanks, a common size of which is 10 feet in depth and 16 feet in diameter, with a capacity of about 1,500 bushels. An ordinary salting station will contain forty of these tanks, having a capacity of 60,000 bushels.

The cucumbers as they are received from the farmers, if of comparatively uniform size, are dumped directly from the receptacles in which they are delivered into the vats, the vats first being provided to the depth of 12 to 18 inches with 75° to 80° Baumé brine, which is made by adding 2 pounds of salt to each gallon of water. As cucumbers are added 100 pounds of salt are scattered over the fruits for each thousand pounds of cucumbers, which means approximately about 5 pounds of salt to each bushel of cucumbers. If it requires more than a single day to fill the tank a quantity of salt should be scattered over the cucumbers before suspending work at night, and if it is to be carried over Sunday or a holiday the cucumbers should be salted and pressed under the brine from time to time during the interval the work is suspended. This will keep the cucumbers from getting soft and becoming yellow. If the tank is not too large and a false head can be employed this will serve to hold the cucumbers under the brine. In large tanks this is a troublesome process, and the customary means of protecting them is to push them under the brine with a suitable paddle.

After the tank is full of cucumbers and before the false head has been put in place, the weight of the cucumbers in the tank should be estimated and 1 pound of salt added for each hundred pounds of fruit. A part of this salt can be placed on top of the cover and the tank then filled with fresh water until the liquid stands 4 to 6 inches above the top of the cover. The salt should not be washed off the cover by pumping water on it, but the water should be pumped into a tube made of 6-inch boards long enough to reach from the top to the bottom and fitted to one side of the tank, so as to carry the fresh liquid to the bottom.

After this additional quantity of salt has been given, the brine should test between 65° and 70° on Baumé's salt scale. After the tank has stood three or four days the top brine will have lost strength until it has fallen to 35° or 40°, when 4 or 5 pounds of salt to each hundred pounds of fruit should be added. After another period of four or five days, or as soon as the brine falls to 45° or 50°, another addition of 4 pounds of salt to each hundred pounds of fruit should be made in the way above noted. After a week's time the brine should test about 55° or 60°, at which point the cucumbers should keep well, the only additional attention required being to pump the brine over by means of a pump placed in a wooden box at the side of the tank, above mentioned, every five or six days for the first month and once in three weeks or once a month thereafter as long as the pickles are held in the brine. The pumping over is for the purpose of raising to the top the heavy brine, which naturally settles to the bottom of the tank, and to cause the contents of the tank to be more evenly salted.

During the time the tank is being filled the brine is kept deep enough to nearly cover the pickles at all times. After the tank has been entirely filled with cucumbers—that is, heaped up with cucumbers to a height of from 18 inches to 2 feet above the rim of the tank—1 pound of salt to each hundred pounds of cucumbers in the tank is placed over the top layer of cucumbers, as noted above. The false head of the tank is then put in place, stringers are laid on top of it, and the whole is weighted with barrels of salt or other material to force the cucumbers into the tank and beneath the surface of the brine.

The gathering and handling of cucumbers at the salting station involve comparatively little labor, but because the cucumbers are not used immediately by the factories it requires the capital invested to be tied up for a considerable period of time.

The fact that this salt stock can be held without material loss for several years places the pickling industry upon a comparatively safe basis. A crop failure in one locality in any particular year does not, as a rule, affect the work of the factory or change the price of fresh stock. The reserve stored stock can be drawn upon for the needs of the factory.

There is no reason why the work of salting pickle stock should not be economically and satisfactorily done on the farm. The equipment necessary for this work need not be expensive. It can be proportioned to the acreage of cucumbers grown. Instead of 1,500-bushel tanks, small tanks or large casks can be employed for salting and storing the product. The brine will not readily freeze, and for that reason the shelter of any clean, fairly tight storage building will afford sufficient protection. Those engaged in the production of cucumbers for slicing purposes should provide an equipment sufficient to enable them to care for the product of their fields at such times as the shipment of slicing fruits becomes unremunerative. Such stock has a market value and would probably find a ready sale if the practice of salting were to become an established custom among growers.

There is an alternative open to growers of cucumbers either for pickling or slicing purposes—viz, the preparation of dill pickles.

DILL PICKLES.

Dill pickles, which are much prized and command the highest price among pickles, can be made from fresh cucumbers as they come from the vines, or from vat stock which has been carried for some time at the salting station.

Dill pickles from fresh stock.—Dill pickles from fresh cucumbers are of high quality, but not quite as satisfactory keepers as when made from salt stock. In preparing fresh stock for dill purposes, fresh cucumbers as they come from the field are placed in wine casks from which one head has been removed. A layer of pickled dill and 1 quart of dill spice is placed at the bottom of the barrel. The cucumbers should be assorted carefully as to size, one grade of about 4 inches in length being placed in one receptacle and another grade of 5 inches in length, or approximately this length, in another barrel. After a cask has been filled, a layer of dill is placed over the fruits before the head is replaced. After the cask has been reheaded, the commercial practice is to remove the bung and fill the cask containing cucumbers with a 45° Baumé test brine, adding 1 pound of porous alum[a] to each 45 gallons of brine. The cucumbers are left in this brine five days. The first brine is then replaced by a 30° brine, to each 40 gallons of which one-half pound of porous alum and 4 gallons of 80-grain vinegar are added, the whole heated to 160° F. before being placed in casks.

[a] Many hygienists and physiological chemists who are charged with the testing of foods to determine their purity and healthfulness discourage the use of alum in any form in food products, regarding it as deleterious to health. Some of the best manufacturers of pickles in this country state that they do not use alum in their preparations.

Dill pickles from salt stock.—To make dill pickles from salt stock, the cucumbers are removed from the brine, placed in a processing tank and covered with fresh cold water, and are allowed to remain twenty-four hours, after which the water is drawn off. The tank is then again filled with fresh water, to which are added 2 pounds of alum [a] and 2 ounces of turmeric to each barrel of pickles in the tank. The whole mass is then heated up slowly to 130° F. The fruits are allowed to stand in this cooling mixture for twelve hours, when they are sorted and packed.

Before beginning to fill the cask with cucumbers, place a layer of pickled dill herb at the bottom of the cask, fill the cask half full of processed cucumbers, and add another layer of dill herb, at the same time placing in the cask one quart of dill spice, consisting of the following proportions of whole spices: 4 pounds of allspice, 2 pounds of crushed black pepper, 4 pounds of coriander seed, and 1 pound of bay leaves. After adding this spice and the layer of dill herb, complete the filling of the cask, but before replacing the head of the cask scatter another layer of dill herb over the cucumbers. After being reheaded, the bung is removed and the cask filled with dill brine consisting of one-fourth barrel of dill herb, 1½ pounds of alum,[a] and 100 gallons of 30° brine. At the time of filling the barrel 1 gallon of 50-grain vinegar is added to each 10 gallons of the brine. This brine should be allowed to stand twenty-four hours before using it to cover the processed cucumbers packed in barrels, as above described.

FORCING CUCUMBERS UNDER GLASS.[b]

Forcing is a technical term used by gardeners to designate the growing of plants out of their normal season under an artificial environment. The cucumber is one of the few garden plants which lend themselves to this manner of cultivation in addition to their more extensive cultivation in the open ground.

Under the stimulus of forcing work, two distinct types of cucumbers have been developed. These are recognized in the trade as the English type and the American type. The English type is purely a product of forcing-house conditions, as the climate of England is not congenial to the growth and development of the cucumber in the open. The American type of cucumber is primarily a product of field conditions, and the few varieties which have been developed to meet the requirements of the forcing house are simply modifications of the existing field or outdoor forms.

The English type of cucumber, shown in figure 1, is a long, cylindrical, uniformly green fruit, with few seeds and a very fleshy seed

[a] See footnote on page 21.

[b] In 1923 Farmers' Bulletin 1320, The Production of Cucumbers in Greenhouses, was issued, and the reader should consult that publication for further details regarding growing this crop under glass.

cavity; in fact, the normal seed cavity of the forced cucumber is almost entirely wanting. The triangular shape characteristic of the normal outdoor cucumber has been lost, and the cylindrical outline almost perfected. While there is considerable difference in the size and length of the various English varieties of cucumbers, they all conform in general to the description above given and to the illustration shown on page 5.

The American type of cucumber, shown in figure 2, page 6, is primarily grown in the field, the product to be used either for pickling or for slicing. Forcing cucumbers in America is confined to those varieties which produce large fruits suitable for slicing. Only three or four of the better and larger field varieties are adapted to this purpose. Notable among these is the White Spine, the Arlington White Spine being the variety which has been especially developed for forcing. The Long Green, or a modification of it, is also sometimes used, but aside from these two varieties there are few that ever find their way into the forcing house. Such varieties as the Boston Pickling, Chicago Pickling, and the cluster varieties in general are not adapted to forcing purposes.

The American ideal for a forcing cucumber is based, of course, upon the outdoor-grown fruit, and in general shape and size the fruits must conform to the best of such fruits. The ideal forcing cucumber for the American market has a slender form, good length, is cylindrical rather than triangular in shape, and of a uniform green color throughout. At the present time there is no variety upon the market which possesses all of these characteristics. The White Spine is objectionable because of the white markings of the greater percentage of these fruits, and now and then an albino appears, which is of course exceedingly objectionable for forcing purposes. The chief objection to white markings upon cucumbers is that as soon as the fruits are removed from the plant these markings have a tendency to turn yellow, indicating age and deterioration. Fruits which are uniformly green in coloring do not show these changes so quickly, and if they are well preserved in cold storage, so as to maintain their crispness of texture, they can be held upon the market much longer than those showing the white markings. From the standpoint of the buyer this characteristic of the white markings is an advantage, in that the purchaser can determine whether or not the cucumbers have been upon the market any length of time by the amount of yellow coloring shown upon the white areas.

FORCING STRUCTURES.

The forcing of cucumbers presupposes that an adequate forcing house or greenhouse is at hand for such work. The chief desideratum in a forcing house for cucumbers is a maximum amount of light,

sufficient headroom, and adequate radiation to maintain a temperature varying from 65° to 85° F. The amount of radiation will, of course, depend upon the style of heating employed, whether steam or hot water, and upon the location of the greenhouse, whether at the north or the south, the outside temperature determining to a considerable extent the amount of radiation required in the house to maintain a given degree of heat.

The forcing house for cucumbers may be a broad, even-span house, with a ridge running north and south, as shown in figure 8, or it may be a flat, lean-to type of house, with a short slope to the north, the north wall high and constructed of brick or timber, and the south wall made solid for only a few inches above the surface of the ground and constructed mainly of glass to give sufficient headroom. The general form of such a house is shown in figure 9. The even-span house should have foundations extending 18 to 20 inches above the surface of the ground and glass from the foundations to the angle formed by the eaves, which should be of sufficient height to give headroom in the house. Five feet from the floor level of the house to the angle of the eaves is not too great a distance and 6 feet is more desirable. The angle of the roof should be about 30 degrees in the latitude of Philadelphia and northward. For a lean-to house the angle of the roof is usually made very flat, the height of the south side being about 5 or 5½ feet, while the height of the north side is about 12 feet for a house 60 feet in width. In these large houses it is the common practice to use solid benches—that is, the earth of the benches in which the plants are to be grown rests directly upon the surface of the ground.

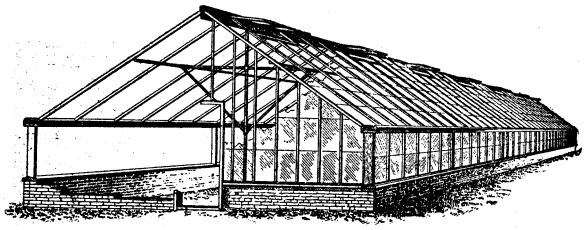

FIG. 8.—Even-span type of forcing house.

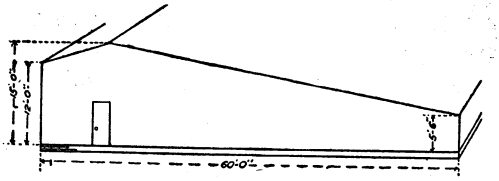

FIG. 9.—Lean-to type of forcing house.

Benches of suitable width, varying from 12 to 16 feet, with narrow walks between, are provided, the surface of the beds being left about 12 inches above the normal ground level. Where it is possible it is better to provide shallow beds carrying about 8 inches of earth slightly elevated above the normal level of the soil, so that the heating pipes, or a number of them at least, can be carried beneath the benches. A type of construction which has proved very satisfactory for this

purpose is a bed 8 feet wide with 8-inch side boards carried upon 2 by 4 inch oak or hardwood joists raised about 6 inches from the ground level of the greenhouse. The heating pipes for water under pressure or for steam can be carried beneath this bench and just above the surface of the ground, thus producing bottom heat, which is most desirable for forcing cucumbers. For the broad house above suggested this type of bench construction, while it is somewhat expensive, will prove very satisfactory. The width of the bench is not too great for training cucumbers, four rows of plants being trained in each bed of this width, the plants being set about 12 inches from the border of the bed and parallel with either side and a double row of plants

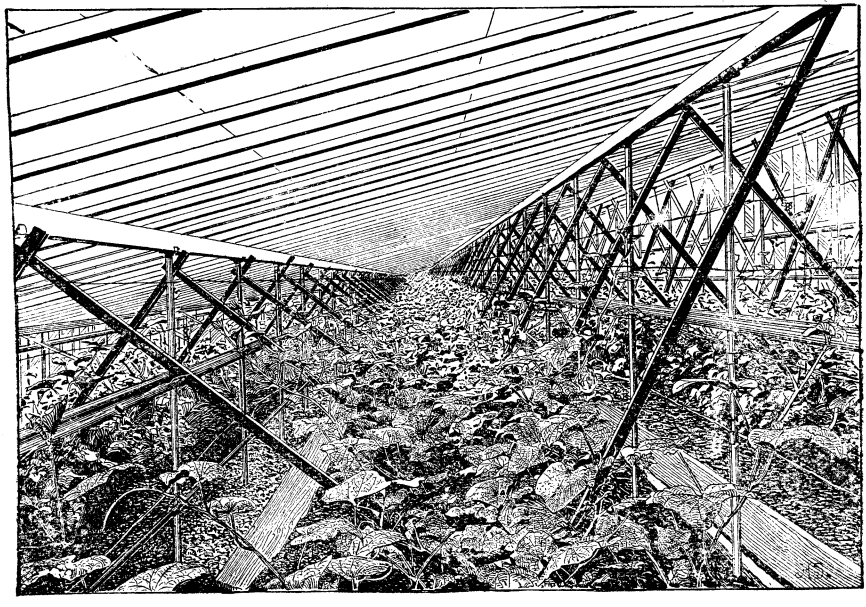

FIG. 10.—Trellis for training cucumbers.

18 inches apart through the center. The training is then accomplished by constructing an A-shaped trellis after the manner of the one shown in figure 10. This trellis is high enough and broad enough to allow the gardener to pass beneath it for the purpose of spraying and harvesting the fruits.

CULTURAL DIRECTIONS FOR FORCING-HOUSE CUCUMBERS.

Soil for the benches.—The soil for the best development of the cucumber should be a rich compost which would fall under the classification of a sandy loam. Sods from an old pasture with a good turf overtopping a clay loam, composted with about one-third its bulk of

cow manure to which, at the time of placing it in the greenhouse, about 15 per cent of its bulk of sand is added, should make a good soil for cucumbers. From time to time during the growth of the cucumbers they should be watered with liquid manure from a leach containing fresh horse manure and sheep manure. It should be the aim of the grower to keep the plant in the most vigorous possible condition.

Propagation.—There are a number of methods of propagation followed by successful cucumber growers, all of which have some advantages. Three of the more common practices are as follows: (1) To plant the seeds of cucumbers in the soil of the bench where the plants are to grow and mature; (2) to plant the seeds of the cucumbers in 3-inch or 4-inch pots filled about half full of soil and after the seeds have germinated and the hypocotyl or stem of the seedling has elongated to fill the pots well up to the seed leaves with soil; and (3) to plant the seeds in cups similar to those used for harvesting strawberries, except that the cups for this purpose are usually made of Georgia pine.

In the first case, where the seeds are planted directly in the soil on the benches, cucumbers are usually employed as a crop to follow lettuce, seeds being planted in the lettuce benches before the crop is entirely removed, heads of lettuce being taken out at proper distances to allow for the correct spacing of the cucumber plants, and the seeds of cucumbers planted in the areas so left.

In the other two cases the rearing of the plants for forcing purposes can be carried on in a small house specially designed for this purpose or in a general propagating house, thus obviating the necessity of heating and maintaining normal conditions in the growing house during the period previous to which the plants begin to run.

Planting on the benches.—As soon as the plants show well-developed runners and are 10 to 12 inches long they should be placed in their permanent position upon the greenhouse benches. Plants grown in pots must be carefully removed from these receptacles to the bench, but those grown in the wooden cups above referred to can be planted, cup and all, in the soil of the bench.

The utmost care should be exercised to keep the plants of the cucumber growing rapidly at all times. If cucumbers receive a severe check or are placed under conditions which are not entirely congenial to them, they are liable to become dwarfed and stunted, and as soon as vigorous growth ceases they become the prey of the melon aphis, mildew, and other pests and diseases which are so annoying to growers of cucumbers under artificial conditions.

Distance to plant.—After the plants have attained a height of 10 or 12 inches and are in a vigorous growing condition they should be placed about 15 or 18 inches apart in single rows upon the side benches

of the greenhouse, which are normally 3½ feet wide, or if planted on the 8-foot benches referred to they should be planted about 10 or 12 inches from the edge of the bench and 15 to 18 inches apart and parallel with the edge of the bench. In the broad benches, where more than a double row can be carried, plants can be set about 18 inches apart and in rows about 2 feet apart. A satisfactory plan for an 8-foot bench will be a row parallel with and 10 inches from each edge of the bench and a double row 18 inches apart through the middle of the bench. This style of planting will allow the use of a double-A trellis, such as shown in figure 10. It is well, however, to allow as much space as possible. The cucumber is a rank-growing plant and many side branches will develop if sufficient space is allowed.

Training the plants.—As soon as the plants show a tendency to run they should be trained so as to keep them from becoming unduly tangled and in order to fill all the space upon the trellis. The trellis can be made of light edging seven-eighths inch square, tacked to the side of the bench when the cucumbers are grown on wood benches and set up in the form of the letter A, as shown in figure 10, page 25. Galvanized wires No. 16 can be run lengthwise of the house and stapled to the supports, which should be placed about 6 feet apart. Upon side benches which are elevated it will be necessary to train the cucumbers to the framework of the greenhouse. For this purpose screw eyes about 8 inches in length can be placed in the sash bars at intervals of 4 or 5 feet and the parallel wires to which the vines are to be tied stretched 12 inches apart lengthwise of the house through these screw eyes and firmly fastened at the ends. The vines should then be loosely tied to the supporting wires with raffia or soft cotton yarn. When the fruits become heavy, as in the case of the English varieties, it will become necessary to truss them, as shown in figure 1, page 5, to prevent their weight breaking the vines. Heavy fruits will cause the supporting wires or bands of raffia to break or girdle the vines unless they are supported independently.

The American varieties seldom attain sufficient size to require this precaution. Fruits of these varieties as soon as they are 8 to 10 inches in length and 2 inches in diameter are harvested for market. The vines are usually sufficiently strong to withstand the weight of fruit of this size.

Pollination.—The cucumber, like the other members of the gourd family to which it belongs, bears two kinds of blossoms on widely separated parts of the plant. The staminate or nonfruit-bearing flower, shown in figure 11, is the first to appear and is in general borne near the base of the plant. The pistillate blossom with the embryo cucumbers at its base, shown in figure 12, appears later and is borne near the extremity of the newly forming and rapidly growing shoots.

Since these flowers are normally produced in this way, it is necessary that a transfer of pollen be made from the staminate to the pistillate flowers through the agency of insects or by other artificial means.

Under greenhouse conditions and at the time of year that the cucumber is forced it is necessary to provide for pollination. In small establishments this work can be done by hand. The staminate blossoms are removed, the petals turned back so as to allow the anthers to project, and the pencil thus produced is then thrust into the cup of the pistillate flower in such a way as to distribute pollen upon the stigma of the pistillate flower. In large establishments where hand pollination is out of the question a colony of honey bees is placed in each house to accomplish the work.

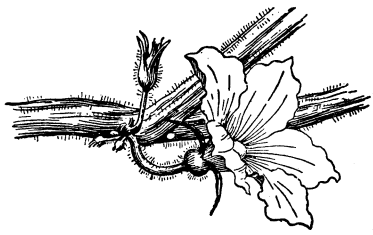

FIG. 11.—Staminate flower of cucumber.

Preparing cucumbers for market.—Cucumbers which are forced in greenhouses are prepared for market in one of the following ways:

The American types of cucumbers are usually gathered from the plants when from 7 to 8 inches in length, being selected according to size and ripeness, and are packed in boxes about 8 inches deep and about 24 inches square, as shown in figure 13, this being a box of cucumbers grown in a greenhouse near Charleston, S. C., and prepared for shipment to the northern markets. Cucumbers grown in frames, as well as those grown for slicing purposes in the open ground, are usually picked when about the size mentioned and are commonly marketed in the Delaware type of basket, holding from one-half a bushel to a bushel, depending upon the season and the condition of the market. The outdoor crop, as has been noted, is usually marketed in bushel or half-barrel baskets, while frame-grown cucumbers are marketed in half-bushel baskets.

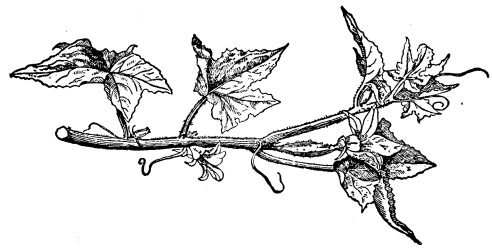

FIG. 12.—Pistillate flower of cucumber.

English cucumbers when grown for shipment are carefully wrapped, as are oranges or tomatoes, and packed in boxes similar to those first described, but of dimensions suited to the size of the fruits.

ENEMIES AND DISEASES OF FORCING-HOUSE CUCUMBERS.

To produce the best results in the greenhouse, untiring attention must be given to the maintenance of proper moisture and temperature conditions. A keen watch must be kept for the appearance of aphis or mildew, and upon the occurrence of either of these pests prompt and effective methods must be employed for stamping it out.

The cucumber is a tender plant and will not endure some of the severe methods employed for combating aphis and mildew on other plants. The careful spraying of cucumbers with ammoniacal carbonate of copper solution, which is made by dissolving 5 ounces of carbonate of copper in three pints of strong ammonia (26°) is recommended. This stock solution should be diluted to 45 gallons when used—that is, one pint of the solution will make 15 gallons of the spraying mixture. This should be applied with a strong force pump through either a Vermorel or a similar nozzle and should keep the house free from mildew.

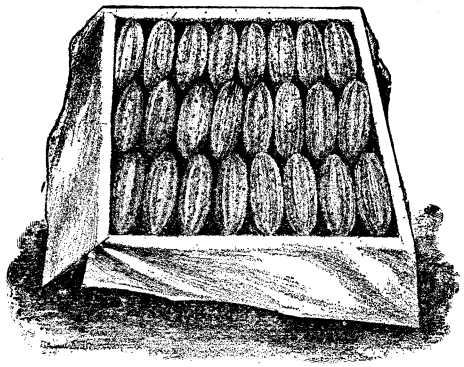

FIG. 13.—Greenhouse cucumbers packed for shipment.

An additional safeguard is to keep the heating pipes at all times covered with sulphur. When it is not desirable to moisten the foliage of the plants with a spray the distillation of sulphur in accordance with the following plan is very effective. This is accompanied by some danger, however, and the novice should carefully observe and carry out every detail of the directions here given.

Distillation of sulphur.—The apparatus for distilling sulphur in a greenhouse for the treatment of mildew consists of a small, single-burner oil stove. One with a top 6 inches square will serve the purpose. Secure two iron or tin pans similar to those used for the baking of layer cake and, if possible, have one pan larger in diameter by two inches than the other. In the larger pan place a layer of sand, as free from organic matter as possible, about one-half inch deep. Upon this set the second pan, which contains flowers of sulphur in sufficient quantity to fill the pan about half full of sulphur when it is molten. Light the lamp, heating the sand to a sufficient degree to melt and maintain the sulphur in a molten condition, but exercise the greatest care in regulating the flame of the lamp, so that it shall never touch the edge of the

pan containing the sulphur and observe every precaution to keep the sulphur from becoming ignited. **Burning sulphur in an inclosure containing living plants is certain death to all plants contained in the area.** The distillation of sulphur by keeping it in a molten condition over a sand bath is perfectly harmless to the plants, but is destructive to parasitic fungi like lettuce mildew and cucumber mildew. The device used for distillation as above described is shown in figure 14.

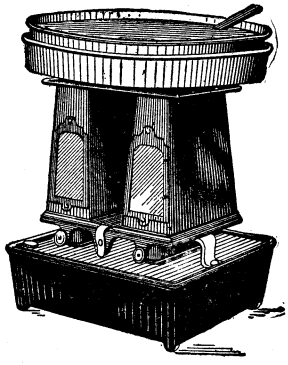

FIG. 14.—Device for distilling sulphur.

The melon aphis, which is frequently troublesome upon cucumbers under greenhouse conditions, can be controlled by spraying the plants with whale-oil soap or kerosene emulsion. Under ordinary conditions a treatment with one of the commercial smudges of nicotine will usually be sufficient. Information in regard to the treatment of the melon aphis and other insect enemies of the cucumber will be furnished on application to the Bureau of Entomology.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

October 5, 1923.

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